Zeolite supported platinum nanoparticles for small organic molecule oxidation and reduction in fuel cell using impregnation method

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Abstract

The performance of platinum (Pt)-impregnated NaY zeolite electrocatalyst has been evaluated for small molecule oxidation and reduction. The Cyclic Voltammetry (CV) measurement has provided a contradicting trend of electrochemical oxidation and reduction activity of methanol (CH_3OH) and formic acid (HCOOH) on Pt impregnated zeolite electrocatalyst, where the HCOOH has shown a similar level of oxidation and reduction activity to those observed on Pt zeolite electrocatalyst made by ion exchange method, whilst a decrease of CH_3OH oxidation and reduction was detected by using Pt impregnated zeolite catalyst. This may be associated to Pt nanoparticle size and Pt surface distribution on zeolite. The en-situ Extended X-Ray Adsorption Fine Structure (EXAFS) analysis has shown Pt particle size is smaller for those made by impregnation method than by ion exchange process [(1)] at same Pt loading on zeolite. The X Ray Diffraction (XRD) measurement reveals there is a reduction of zeolite crystallinity under calcinations and reduction process with correspondent to 50% decrease of zeolite pores, which was confirmed by Brunauer Emmett and Teller (BET) surface measurement.

Reference

1. Yao, Jun and Yufeng, Yao **(2016)**, **International Journal of Hydrogen Energy**, 41. pp.14747-14757.